

# MENIIT

NEET | IIT-JEE | FOUNDATION

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Maximum Marks: 720

Time : 3 Hours

Paper Code

**G3**

## NEET (UG) – 2020

### IMPORTANT INSTRUCTIONS

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on **side-1** and **side-2** carefully with blue/black ball point pen only.
2. The test is of 3 hours duration and Test Booklet contains **180** questions. Each question carries **4 marks**. For each correct response, the candidate will get **4 marks**. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks are **720**.
3. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/markings responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must hand over the Answer Sheet to the invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.**
6. The CODE for this Booklet is **P3**. Make sure that the CODE printed on **Side-2** of the Answer Sheet is the same as that on this Test Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/Answer Sheet.
8. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.
9. Each candidate must show on demand his/her Admit Card to the Invigilator.
10. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
11. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. **Cases where a candidate has not signed the Attendance Sheet second time will be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case.**
12. Use of Electronic/Manual Calculator is prohibited.
13. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this Examination.
14. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
15. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.

## Section- I (BIOLOGY)

- Identify the **wrong** statement with reference to transport of oxygen:
  - Partial pressure of  $\text{CO}_2$  can interfere with  $\text{O}_2$  binding with haemoglobin
  - Higher  $\text{H}^+$  conc. in alveoli favours the formation of oxyhaemoglobin
  - Low  $\text{pCO}_2$  in alveoli favours the formation of oxyhaemoglobin
  - Binding of oxygen with haemoglobin is mainly related to partial pressure of  $\text{O}_2$
- Which of the following refer to **correct** example(s) of organisms which have evolved due to changes in environment brought about by anthropogenic action?
  - Darwin's Finches of Galapagos islands
  - Herbicide resistant weeds
  - Drug resistant eukaryotes
  - Man-created breeds of domesticated animals like dogs

(1) (a) and (c)      (2) (b), (c) and (d)      (3) only (d)      (4) only (a)
- Which of the following is **not** an inhibitory substance governing seed dormancy?
  - Abscisic acid      (2) Phenolic acid      (3) Para-ascorbic acid      (4) Gibberellic acid
- Match the following diseases with the causative organism and select the **correct** option:
 

Column – I		Column – II	
(a)	Typhoid	(i)	<i>Wuchereria</i>
(b)	Pneumonia	(ii)	<i>Plasmodium</i>
(c)	Filariasis	(iii)	<i>Salmonella</i>
(d)	Malaria	(iv)	<i>Haemophilus</i>

(1) (a) – (iii), (b) – (iv), (c) – (i), (d) – (ii)  
 (2) (a) – (ii), (b) – (i), (c) – (iii), (d) – (iv)  
 (3) (a) – (iv), (b) – (i), (c) – (ii), (d) – (iii)  
 (4) (a) – (i), (b) – (iii), (c) – (ii), (d) – (iv)
- Select the **correct** events that occur during inspiration:
  - Contraction of diaphragm
  - Contraction of external inter-costal muscles
  - Pulmonary volume decreases
  - Intra pulmonary pressure increases

(1) (c) and (d)      (2) (a), (b) and (d)      (3) only (d)      (4) (a) and (b)
- The oxygenation activity of RuBisCo enzyme in photorespiration leads to the formation of:
  - 1 molecule of 3 – C compound      (2) 1 molecule of 6 – C compound
  - 1 molecule of 4 – C compound and 1 molecule of 2 – C compound
  - 2 molecules of 3 – C compound
- In light reaction, plastoquinone facilitates the transfer of electrons from:
  - Cyt  $b_6 f$  complex to PS – I      (2) PS – I to  $\text{NADP}^+$
  - PS – I to ATP synthase      (4) PS – II to cyt  $b_6 f$  complex
- In gel electrophoresis, separated DNA fragments can be visualized with the help of:
  - Ethidium bromide in UV radiation      (2) Acetocarmine in UV radiation
  - Ethidium bromide in infrared radiation      (4) Acetocarmine in bright blue light

9. The QRS complex in a standard ECG represents:
- (1) Depolarisation of auricles (2) Depolarisation of ventricles  
 (3) Repolarisation of ventricles (4) Repolarisation of auricles
10. The plant parts which consist of two generations one within the other:
- (a) Pollen grains inside the anther (b) Germinated pollen grain with two male gametes  
 (c) Seed inside the fruit (d) Embryo sac inside the ovule  
 (1) (a), (b) and (c) (2) (c) and (d) (3) (a) and (d) (4) (a) only
11. The infectious stage of *Plasmodium* that enters the human body is:
- (1) Sporozoites (2) Female gametocytes  
 (3) Male gametocytes (4) Trophozoites
12. Identify the **incorrect** statement:
- (1) Sapwood is involved in conduction of water and minerals from root to leaf  
 (2) Sapwood is the innermost secondary xylem and is lighter in colour  
 (3) Due to deposition of tannins, resins, oils etc, heart wood is dark in colour  
 (4) Heart wood does not conduct water but gives mechanical support
13. Flippers of Penguins and Dolphins are examples of:
- (1) Convergent evolution (2) Industrial melanism  
 (3) Natural selection (4) Adaptive radiation
14. Identify the **wrong** statement with reference to the gene 'I' that controls ABO blood groups:
- (1) A person will have only two of the three alleles  
 (2) When  $I^A$  and  $I^B$  are present together, they express same type of sugar  
 (3) Allele 'i' does not produce any sugar  
 (4) The gene (I) has three alleles
15. Which of the following statements are **true** for the phylum – Chordata?
- (a) In Urochordata notochord extends from head to tail and it is present throughout their life  
 (b) In Vertebrata notochord is present during embryonic period only  
 (c) Central nervous system is dorsal and hollow  
 (d) Chordata is divided into 3 subphyla: Hemichordata, Tunicata and Cephalochordata  
 (1) (c) and (a) (2) (a) and (b) (3) (b) and (c) (4) (d) and (c)
16. Presence of which of the following conditions in urine are indicative of Diabetes Mellitus?
- (1) Uremia and Renal Calculi (2) Ketonuria and Glycosuria  
 (3) Renal calculi and Hyperglycaemia (4) Uremia and Ketonura
17. The first phase of translation is:
- (1) Recognition of DNA molecule (2) Aminoacylation of tRNA  
 (3) Recognition of an anti – codon (4) Binding of mRNA to ribosome
18. Ray florets have:
- (1) Superior ovary (2) Hypogynous ovary (3) Half inferior ovary (4) Inferior ovary
19. The process of growth is maximum during:
- (1) Lag phase (2) Senescence (3) Dormancy (4) Log phase
20. The roots that originate from the base of the stem are:
- (1) Primary roots (2) Prop roots (3) Lateral roots (4) Fibrous roots

21. In water hyacinth and water lily, pollination takes place by:  
 (1) water currents only (2) wind and water  
 (3) insects and water (4) insects or wind
22. Which of the following is put into Anaerobic sludge digester for further sewage treatment?  
 (1) Floating debris (2) Effluents of primary treatment  
 (3) Activated sludge (4) Primary sludge
23. Bilaterally symmetrical and acoelomate animals are exemplified by:  
 (1) Platyhelminthes (2) Aschelminthes (3) Annelida (4) Ctenophora
24. Identify the basic amino acid from the following:  
 (1) Glutamic acid (2) Lysine (3) Valine (4) Tyrosine
25. In which of the following techniques, the embryos are transferred to assist those females who cannot conceive?  
 (1) GIFT and ZIFT (2) ICST and ZIFT (3) GIFT and ICST (4) ZIFT and IUT
26. Which of the following statements about inclusion bodies is **incorrect**?  
 (1) These are involved in ingestion of food particles  
 (2) They lie free in the cytoplasm  
 (3) These represent reserve material in cytoplasm  
 (4) They are not bound by any membrane
27. Experimental verification of the chromosomal theory of inheritance was done by:  
 (1) Sutton (2) Boveri (3) Morgan (4) Mendel
28. Select the option including all sexually transmitted diseases:  
 (1) Gonorrhoea, Malaria, Genital herpes (2) AIDS, Malaria, Filaria  
 (3) Cancer, AIDS, Syphilis (4) Gonorrhoea, Syphilis, Genital herpes
29. Which of the following statements is **not correct**?  
 (1) The proinsulin has an extra peptide called C – peptide  
 (2) The functional insulin has A and B chains lined together by hydrogen bonds  
 (3) Genetically engineered insulin is produced in *E. Coli*  
 (4) In man insulin is synthesized as a proinsulin
30. Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells?  
 (1) Peroxisomes (2) Golgi bodies  
 (3) Polysomes (4) Endoplasmic reticulum
31. Match the following columns and select the **correct** option:

Column – I		Column – II	
(a)	<i>Clostridium butylicum</i>	(i)	Cyclosporin – A
(b)	<i>Trichoderma polysporum</i>	(ii)	Butyric acid
(c)	<i>Monascus purpureus</i>	(iii)	Citric acid
(d)	<i>Aspergillus niger</i>	(iv)	Citric acid

- (1) (a) – (ii), (b) – (i), (c) – (iv), (d) – (iii)  
 (2) (a) – (i), (b) – (ii), (c) – (iv), (d) – (iii)  
 (3) (a) – (iv), (b) – (iii), (c) – (ii), (d) – (i)  
 (4) (a) – (iii), (b) – (iv), (c) – (ii), (d) – (i)

32. Embryological support for evolution was disapproved by:  
 (1) Alfred Wallace (2) Charles Darwin (3) Oparin (4) Karl Ernst von Baer
33. The sequence that controls the copy number of the linked DNA in the vector, is termed:  
 (1) Ori site (2) Palindromic sequence  
 (3) Recognition site (4) Selectable marker
34. Which of the following is **correct** about viroids?  
 (1) They have free RNA without protein coat (2) They have DNA with protein coat  
 (3) They have free DNA without protein coat (4) They have RNA with protein coat
35. Montreal protocol was signed in 1987 for control of:  
 (1) Emission of ozone depleting substances  
 (2) Release of Green House gases (3) Disposal of e – wastes  
 (4) Transport of Genetically modified organisms from one country to another
36. The number of substrate level phosphorylations in one turn of citric acid cycle is:  
 (1) One (2) Two (3) Three (4) Zero
37. Which of the following hormones levels will cause release of ovum (ovulation) from the graffian follicle?  
 (1) High concentration of Progesterone (2) Low concentration of LH  
 (3) Low concentration of FSH (4) High concentration of Estrogen
38. Select the **correct** match:  
 (1) Phenylketonuria – Autosomal dominant trait  
 (2) Sickle cell anaemia – Autosomal recessive trait, chromosome – 11  
 (3) Thalassaemia – X linked  
 (4) Haemophilia – Y linked
39. Cuboidal epithelium with brush border of microvilli is found in:  
 (1) ducts of salivary glands (2) proximal convoluted tubule of nephron  
 (3) eustachian tube (4) lining of intestine
40. Snow – blindness in Antarctic region is due to:  
 (1) Inflammation of cornea due to high dose of UV – B radiation  
 (2) High reflection of light from snow  
 (3) Damage to retina caused by infra – red rays  
 (4) Freezing of fluids in the eye by low temperature
41. Which of the following pairs is of unicellular algae?  
 (1) *Gelidium* and *Gracilaria* (2) *Anabaena* and *Volvox*  
 (3) *Chlorella* and *Spirulina* (4) *Laminaria* and *Sargassum*
42. The transverse section of a plant shows following anatomical features:  
 (a) Large number of scattered vascular bundles surrounded by bundle sheath  
 (b) Large conspicuous parenchymatous ground tissue  
 (c) Vascular bundles conjoint and closed (d) Phloem parenchyma absent  
 Identify the category of plant and its part:  
 (1) Monocotyledonous root (2) Dicotyledonous stem  
 (3) Dicotyledonous root (4) Monocotyledonous stem

43. How many true breeding pea plant varieties did Mendel select as pairs, which were similar except in one character with contrasting traits?  
 (1) 2 (2) 14 (3) 8 (4) 4
44. Floridean starch has structure similar to:  
 (1) Amylopectin and glycogen (2) Mannitol and algin  
 (3) Laminarin and cellulose (4) Starch and cellulose
45. Identify the **correct** statement with regard to  $G_1$  phase (Gap 1) of interphase:  
 (1) Reorganisation of all cell components takes place  
 (2) Cell is metabolically active, grow but does not replicate its DNA  
 (3) Nuclear Division takes place  
 (4) DNA synthesis or replication takes place
46. By which method was a new breed 'Hisardale' of sheep formed by using Bikaneri ewes and Marino rams?  
 (1) Mutational breeding (2) Cross breeding  
 (3) Inbreeding (4) Out crossing
47. Identify the wrong statement with reference to immunity.  
 (1) When ready-made antibodies are directly given, it is called "Passive immunity".  
 (2) Active immunity is quick and gives full response.  
 (3) Foetus receives some antibodies from mother, it is an example for passive immunity.  
 (4) When exposed to antigen (living or dead) antibodies are produced in the host's body. It is called "Active immunity".
48. The specific palindromic sequence which recognized by EcoRI is:  
 (1) 5' - GGAACC - 3'  
 3' - CCTTGG - 5'  
 (2) 5' - CTTAAG - 3'  
 3' - GAATTC - 5'  
 (3) 5' - GGATCC - 3'  
 3' - CCTAGG - 5'  
 (4) 5' - GAATTC - 3'  
 3' - CTTAAG - 5'
49. If the distance between two consecutive base pairs is 0.34 nm and the total number of base pairs of a DNA double helix in a typical mammalian cell is  $6.6 \times 10^9$  bp, then the length of the DNA is approximately:  
 (1) 2.5 meters (2) 2.2 meters (3) 2.7 meters (4) 2.0 meters
50. If the head of cockroach is removed, it may live for few days because:  
 (1) the cockroach does not have nervous system.  
 (2) the head holds a small proportion of a nervous system while the rest is situated along the ventral part of its body.  
 (3) the head holds a 1/3rd of a nervous system while the rest is situated along the dorsal part of its body.  
 (4) the supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen.
51. Match the trophic levels with their correct species examples in grassland ecosystem.  
 (a) Fourth trophic level (i) Crow  
 (b) Second trophic level (ii) Vulture  
 (c) First trophic level (iii) Rabbit  
 (d) Third trophic level (iv) Grass  
 Select the correct option:  
 (a) (b) (c) (d)  
 (1) (iii) (ii) (i) (iv)  
 (2) (iv) (iii) (ii) (i)  
 (3) (i) (ii) (iii) (iv)  
 (4) (ii) (iii) (iv) (i)

52. The enzyme enterokinase helps in conversion of:
- (1) trypsinogen into trypsin
  - (2) caseinogen into casein
  - (3) pepsinogen into pepsin
  - (4) protein into polypeptides
53. Identify the correct statement with reference to human digestive system.
- (1) Serosa is the innermost layer of the alimentary canal.
  - (2) Ileum is a highly coiled part.
  - (3) Vermiform appendix arises from duodenum.
  - (4) Ileum opens into small intestine.
54. Name the plant growth regulator which upon spraying on sugarcane crop, increases the length of stem, thus increasing the yield of sugarcane crop.
- (1) Gibberellin
  - (2) Ethylene
  - (3) Abscisic acid
  - (4) Cytokinin
55. Identify the wrong statement with regard to Restriction Enzymes.
- (1) They cut the strand of DNA at palindromic sites.
  - (2) They are useful in genetic engineering.
  - (3) Sticky ends can be joined by using DNA ligases.
  - (4) Each restriction enzyme functions by inspecting the length of a DNA sequence.
56. Match the following:
- |                                     |               |
|-------------------------------------|---------------|
| (a) Inhibitor of catalytic activity | (i) Ricin     |
| (b) Possess peptide bonds           | (ii) Malonate |
| (c) Cell wall material in fungi     | (iii) Chitin  |
| (d) Secondary metabolite            | (iv) Collagen |
- Choose the correct option from the following:
- |            |            |            |            |            |
|------------|------------|------------|------------|------------|
|            | <b>(a)</b> | <b>(b)</b> | <b>(c)</b> | <b>(d)</b> |
| <b>(1)</b> | (iii)      | (i)        | (iv)       | (ii)       |
| <b>(2)</b> | (iii)      | (iv)       | (i)        | (ii)       |
| <b>(3)</b> | (ii)       | (iii)      | (i)        | (iv)       |
| <b>(4)</b> | (ii)       | (iv)       | (iii)      | (i)        |
57. Goblet cells of alimentary canal are modified from:
- (1) Columnar epithelial cells
  - (2) Chondrocytes
  - (3) Compound epithelial cells
  - (4) Squamous epithelial cells
58. Match the following columns and select the correct option.
- |                                |                      |
|--------------------------------|----------------------|
| <b>Column -I</b>               | <b>Column -II</b>    |
| (a) 6 - 15 pairs of gill slits | (i) Trygon           |
| (b) Heterocercal caudal fin    | (ii) Cyclostomes     |
| (c) Air Bladder                | (iii) Chondrichthyes |
| (d) Poison sting               | (iv) Osteichthyes    |
- |            |            |            |            |            |
|------------|------------|------------|------------|------------|
|            | <b>(a)</b> | <b>(b)</b> | <b>(c)</b> | <b>(d)</b> |
| <b>(1)</b> | (iii)      | (iv)       | (i)        | (ii)       |
| <b>(2)</b> | (iv)       | (ii)       | (iii)      | (i)        |
| <b>(3)</b> | (i)        | (iv)       | (iii)      | (ii)       |
| <b>(4)</b> | (ii)       | (iii)      | (iv)       | (i)        |

59. Dissolution of the synaptonemal complex occurs during:  
 (1) Zygotene (2) Diplotene (3) Leptotene (4) Pachytene
60. Name the enzyme that facilitates opening of DNA helix during transcription.  
 (1) DNA helicase (2) DNA polymerase (3) RNA polymerase (4) DNA ligase
61. Which of the following statements is correct?  
 (1) Adenine pairs with thymine through one H-bond.  
 (2) Adenine pairs with thymine through three H-bonds.  
 (3) Adenine does not pair with thymine.  
 (4) Adenine pairs with thymine through two H-bonds.
62. Which of the following regions of the globe exhibits highest species diversity?  
 (1) Madagascar (2) Himalayas  
 (3) Amazon forests (4) Western Ghats of India
63. Match the following columns and select the correct option.
- | Column - I          |                          | Column -II |            |
|---------------------|--------------------------|------------|------------|
| (a) Pituitary gland | (i) Grave's disease      |            |            |
| (b) Thyroid gland   | (ii) Diabetes mellitus   |            |            |
| (c) Adrenal gland   | (iii) Diabetes insipidus |            |            |
| (d) Pancreas        | (iv) Addison's disease   |            |            |
| <b>(a)</b>          | <b>(b)</b>               | <b>(c)</b> | <b>(d)</b> |
| (1) (iii)           | (ii)                     | (i)        | (iv)       |
| (2) (iii)           | (i)                      | (iv)       | (ii)       |
| (3) (ii)            | (i)                      | (iv)       | (iii)      |
| (4) (iv)            | (iii)                    | (i)        | (ii)       |
64. The product(s) of reaction catalyzed by nitrogenase in root nodules of leguminous plants is/are :  
 (1) Nitrate alone (2) Ammonia and oxygen  
 (3) Ammonia and hydrogen (4) Ammonia alone
65. Match the following concerning essential elements and their functions in plants:
- |               |   |
|---------------|---|
| (a) Iron      | (i) Photolysis of water                     |
| (b) Zinc      | (ii) Pollen germination                     |
| (c) Boron     | (iii) Required for chlorophyll biosynthesis |
| (d) Manganese | (iv) IAA biosynthesis                       |
- Select the correct option:
- | (a)       | (b)   | (c)  | (d)   |
|-----------|-------|------|-------|
| (1) (iv)  | (iii) | (ii) | (i)   |
| (2) (iii) | (iv)  | (ii) | (i)   |
| (3) (iv)  | (i)   | (ii) | (iii) |
| (4) (ii)  | (i)   | (iv) | (iii) |
66. Which of the following would help in prevention of diuresis?  
 (1) Reabsorption of  $\text{Na}^+$  and water from renal tubules due to aldosterone  
 (2) Atrial natriuretic factor causes vasoconstriction  
 (3) Decrease in secretion of renin by JG cells  
 (4) More water reabsorption due to under secretion of ADH



67. Meiotic division of the secondary oocyte is completed:

- (1) At the time of copulation
- (2) After zygote formation
- (3) At the time of fusion of a sperm with an ovum
- (4) Prior to ovulation

68. Match the following columns and select the correct option:

Column – I		Column – II	
(a)	Gregarious, polyphagous pest	(i)	Asterias
(b)	Adult with radial symmetry and larva with bilateral symmetry	(ii)	Scorpion
(c)	Book lungs	(iii)	Ctenoplane
(d)	Bioluminescence	(iv)	Locusta

- (1) (a) – (iv), (b) – (i), (c) – (ii), (d) – (iii)
- (2) (a) – (iii), (b) – (ii), (c) – (i), (d) – (iv)
- (3) (a) – (ii), (b) – (i), (c) – (iii), (d) – (iv)
- (4) (a) – (i), (b) – (iii), (c) – (ii), (d) – (iv)

69. Match the following columns and select the correct option:

Column – I		Column – II	
(a)	Floating Ribs	(i)	Located between second and seventh ribs
(b)	Acromion	(ii)	Head of the Humerus
(c)	Scapula	(iii)	Clavicle
(d)	Glenoid cavity	(iv)	Do not connect with the sternum

- (1) (a) – (i), (b) – (iii), (c) – (ii), (d) – (iv)
- (2) (a) – (iii), (b) – (ii), (c) – (iv), (d) – (i)
- (3) (a) – (iv), (b) – (iii), (c) – (i), (d) – (ii)
- (4) (a) – (ii), (b) – (iv), (c) – (i), (d) – (iii)

70. Secondary metabolites such as nicotine, strychnine and caffeine are produced by plants for their:

- (1) Growth response
- (2) Defence action
- (3) Effect on reproduction
- (4) Nutritive value

71. Match the following columns and select the correct option:

Column – I		Column – II	
(a)	Bt cotton	(i)	Gene therapy
(b)	Adenosine deaminase deficiency	(ii)	Cellular defence
(c)	RNAi	(iii)	Detection of HIV infection
(d)	PCR	(iv)	<i>Bacillus thuringiensis</i>

- (1) (a) – (iii), (b) – (ii), (c) – (i), (d) – (iv)
- (2) (a) – (ii), (b) – (iii), (c) – (iv), (d) – (i)
- (3) (a) – (i), (b) – (ii), (c) – (iii), (d) – (iv)
- (4) (a) – (iv), (b) – (i), (c) – (ii), (d) – (iii)

72. From his experiments, S.L. Miller produced amino acids by mixing the following in a closed flask:

- (1) CH<sub>3</sub>, H<sub>2</sub>, NH<sub>4</sub> and water vapor at 800°C
- (2) CH<sub>4</sub>, H<sub>2</sub>, NH<sub>3</sub> and water vapor at 600 °C
- (3) CH<sub>3</sub>, H<sub>2</sub>, NH<sub>3</sub> and water vapor at 600°C
- (4) CH<sub>4</sub>, H<sub>2</sub>, NH<sub>3</sub> and water vapor at 800°C



81. Match the following columns and select the correct option:

Column – I		Column – II	
(a)	Placenta	(i)	Androgens
(b)	Zona pellucida	(ii)	Human Chorionic Gonadotropin(hCG)
(c)	Bulbo – urethral glands	(iii)	Layer of the ovum
(d)	Leydig cells	(iv)	Lubrication of the Penis

- (1) (a) – (i), (b) – (iv), (c) – (ii), (d) – (iii)  
 (2) (a) – (iii), (b) – (ii), (c) – (iv), (d) – (i)  
 (3) (a) – (ii), (b) – (iii), (c) – (iv), (d) – (i)  
 (4) (a) – (iv), (b) – (iii), (c) – (i), (d) – (ii)

82. Which of the following is **not** an attribute of a population?

- (1) Natality (2) Mortality (3) Species interaction (4) Sex ratio

83. Match the following columns and select the correct option:

Column – I		Column -II	
(a)	Organ of Corti	(i)	Connects middle ear and pharynx
(b)	Cochlea	(ii)	Coiled part of the labyrinth
(c)	Eustachian tube	(iii)	Attached to the oval window
(d)	Stapes	(iv)	Located on the basilar membrane

- (1) (a) – (iii), (b) – (i), (c) – (iv), (d) – (ii)  
 (2) (a) – (iv), (b) – (ii), (c) – (i), (d) – (iii)  
 (3) (a) – (i), (b) – (ii), (c) – (iv), (d) – (iii)  
 (4) (a) – (ii), (b) – (iii), (c) – (i), (d) – (iv)

84. Which one of the following is the most abundant protein in the animals?

- (1) Collagen (2) Lectin (3) Insulin (4) Haemoglobin

85. Match the following with respect to meiosis:

- (a) Zygotene (i) Terminalization  
 (b) Pachytene (ii) Chiasmata  
 (c) Diplotene (iii) Crossing over  
 (d) Diakinesis (iv) Synapsis

Select the correct option from the following:

- (a) (b) (c) (d)  
 (1) (iv) (iii) (ii) (i)  
 (2) (i) (ii) (iv) (iii)  
 (3) (ii) (iv) (iii) (i)  
 (4) (iii) (iv) (i) (ii)

86. According to Robert May, the global species diversity is about:

- (1) 20 million (2) 50 million (3) 7 million (4) 1.5 million

87. The ovary is half inferior in:

- (1) Mustard (2) Sunflower (3) Plum (4) Brinjal

88. Select the correct statement.

- (1) Glucagon is associated with hypoglycemia. (2) Insulin acts on pancreatic cells and adipocytes.  
 (3) Insulin is associated with hyperglycemia. (4) Glucocorticoids stimulate gluconeogenesis.

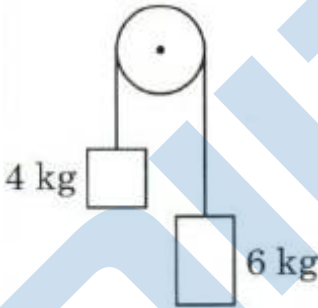
89. The process responsible for facilitating loss of water in liquid form from the tip of grass blades at night and in early morning is:

- (1) Root pressure (2) Imbibition (3) Plasmolysis (4) Transpiration

90. Some dividing cells exit the cell cycle and enter vegetative inactive stage. This is called quiescent stage ( $G_0$ ). This process occurs at the end of:

- (1)  $G_1$  phase (2) S phase (3)  $G_2$  phase (4) M phase

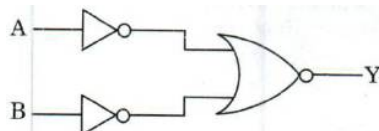
## Section - II (PHYSICS)

91. The phase difference between displacement and acceleration of a particle in a simple harmonic motion is:
- (1)  $\frac{3\pi}{2}$  rad      (2)  $\frac{\pi}{2}$  rad      (3) zero      (4)  $\pi$  rad
92. A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is: ( $\mu_0 = 4\pi \times 10^{-7} \text{ T mA}^{-1}$ )
- (1)  $3.14 \times 10^{-4} \text{ T}$       (2)  $6.28 \times 10^{-5} \text{ T}$       (3)  $3.14 \times 10^{-5} \text{ T}$       (4)  $6.25 \times 10^{-4} \text{ T}$
93. Two bodies of mass 4 kg and 6 kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity (g) is:
- 
- (1)  $g/2$       (2)  $g/5$       (3)  $g/10$       (4)  $g$
94. The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is ( $c =$  speed of electromagnetic waves)
- (1) 1 : 1      (2) 1 : c      (3) 1 :  $c^2$       (4) c : 1
95. In a certain region of space with volume  $0.2 \text{ m}^3$ . The electric potential is found to be 5 V throughout. The magnitude of electric field in this region is:
- (1) 0.5 N/C      (2) 1 N/C      (3) 5 N/C      (4) Zero
96. The average thermal energy for a mono-atomic gas is: ( $k_B$  is Boltzmann constant and T, absolute temperature)
- (1)  $\frac{3}{2} k_B T$       (2)  $\frac{5}{2} k_B T$       (3)  $\frac{7}{2} k_B T$       (4)  $\frac{1}{2} k_B T$
97. Find the torque about the origin when a force of  $3\hat{j} \text{ N}$  acts on a particle whose position vector is  $2\hat{k} \text{ m}$ .
- (1)  $6\hat{j} \text{ Nm}$       (2)  $-6\hat{i} \text{ Nm}$       (3)  $6\hat{k} \text{ Nm}$       (4)  $6\hat{i} \text{ Nm}$
98. The mean free path for a gas, with molecular diameter d and number density n can be expressed as:
- (1)  $\frac{1}{\sqrt{2} n \pi d^2}$       (2)  $\frac{1}{\sqrt{2} n^2 \pi d^2}$       (3)  $\frac{1}{\sqrt{2} n^2 \pi^2 d^2}$       (4)  $\frac{1}{\sqrt{2} n \pi d}$
99. The energy equivalent of 0.5 g of a substance is:
- (1)  $4.5 \times 10^{13} \text{ J}$       (2)  $1.5 \times 10^{13} \text{ J}$       (3)  $0.5 \times 10^{13} \text{ J}$       (4)  $4.5 \times 10^{16} \text{ J}$

100. A screw gauge has least count of 0.01 mm and there are 50 divisions in its circular scale. The pitch of the screw gauge is:  
 (1) 0.25 mm                      (2) 0.5 mm                      (3) 1.0 mm                      (4) 0.01 mm
101. Two cylinders A and B of equal capacity are connected to each other via a stop cock. A contains an ideal gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stop cock is suddenly opened. The process is:  
 (1) adiabatic                      (2) isochoric                      (3) isobaric                      (4) isothermal
102. A cylinder contains hydrogen gas at pressure of 249 kPa and temperature 27°C. Its density is: ( $R = 8.3 \text{ J mol}^{-1} \text{ K}^{-1}$ )  
 (1) 0.2 kg/m<sup>3</sup>                      (2) 0.1 kg/m<sup>3</sup>                      (3) 0.02 kg/m<sup>3</sup>                      (4) 0.5 kg/m<sup>3</sup>
103. When a uranium isotope  ${}_{92}^{235}\text{U}$  is bombarded with a neutron. It generates  ${}_{36}^{89}\text{Kr}$ , three neutrons and:  
 (1)  ${}_{40}^{91}\text{Zr}$                       (2)  ${}_{36}^{101}\text{Kr}$                       (3)  ${}_{36}^{103}\text{Kr}$                       (4)  ${}_{56}^{144}\text{Ba}$
104. A charged particle having drift velocity of  $7.5 \times 10^{-4} \text{ ms}^{-1}$  in an electric field of  $3 \times 10^{-10} \text{ V m}^{-1}$ , has a mobility in  $\text{m}^2 \text{ V}^{-1} \text{ s}^{-1}$  of:  
 (1)  $2.5 \times 10^6$                       (2)  $2.5 \times 10^{-6}$                       (3)  $2.25 \times 10^{-15}$                       (4)  $2.25 \times 10^{15}$
105. Taking into account of the significant figures, what is the value of  $9.99 \text{ m} - 0.0099 \text{ m}$ ?  
 (1) 9.98 m                      (2) 9.980 m                      (3) 9.9 m                      (4) 9.9801 m
106. An iron rod of susceptibility 599 is subjected to a magnetizing field of  $1200 \text{ A m}^{-1}$ . The permeability of the material of the rod is: ( $\mu_0 = 4\pi \times 10^{-7} \text{ Tm A}^{-1}$ )  
 (1)  $8.0 \times 10^{-5} \text{ Tm A}^{-1}$                       (2)  $2.4\pi \times 10^{-5} \text{ Tm A}^{-1}$                       (3)  $2.4\pi \times 10^{-7} \text{ Tm A}^{-1}$                       (4)  $2.4\pi \times 10^{-4} \text{ Tm A}^{-1}$
107. A spherical conductor of radius 10 cm has a charge of  $3.2 \times 10^{-7} \text{ C}$  distributed uniformly. What is the magnitude of electric field at a point 15 cm from the centre of the sphere?  $\left( \frac{1}{4\pi \epsilon_0} = 9 \times 10^9 \text{ Nm}^2 / \text{C}^2 \right)$   
 (1)  $1.28 \times 10^5 \text{ N/C}$                       (2)  $1.28 \times 10^6 \text{ N/C}$                       (3)  $1.28 \times 10^7 \text{ N/C}$                       (4)  $1.28 \times 10^4 \text{ N/C}$
108. A series LCR circuit is connected to an ac voltage source. When L is removed from the circuit, the phase difference between current and voltage is  $\frac{\pi}{3}$ . If instead C is removed from the circuit, the phase difference is again  $\frac{\pi}{3}$  between current and voltage. The power factor of the circuit is:  
 (1) 0.5                      (2) 1.0                      (3) -1.0                      (4) Zero
109. A capillary tube of radius  $r$  is immersed in water and water rises in it to a height  $h$ . The mass of the water in the capillary is 5 g. Another capillary tube of radius  $2r$  is immersed in water. The mass of water that will rise in this tube is:  
 (1) 5.0 g                      (2) 10.0 g                      (3) 20.0 g                      (4) 2.5 g

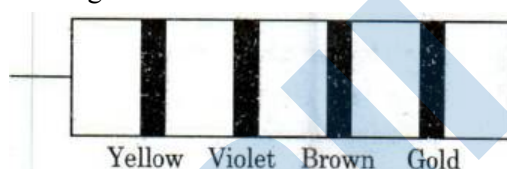
110. In Young's double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes:  
 (1) half                      (2) four times                      (3) one – fourth                      (4) double

111. For the logic circuit shown, the truth table is:



	A	B	Y		A	B	Y		A	B	Y		A	B	Y
	0	0	0		0	0	0		0	0	1		0	0	0
(1)	0	1	1	(2)	0	1	1	(3)	0	1	0	(4)	0	1	0
	1	0	1		1	0	1		1	0	0		1	0	0
	1	1	1		1	1	0		1	1	0		1	1	1

112. The color code of a resistance is given below:



The values of resistance and tolerance, respectively are:

- (1) 47 k $\Omega$ , 10%                      (2) 4.7 k $\Omega$ , 5%                      (3) 470  $\Omega$ , 5%                      (4) 470 k $\Omega$ , 5%
113. The capacitance of a parallel plate capacitor with air as medium is 6  $\mu\text{F}$ . With the introduction of a dielectric medium, the capacitance becomes 30  $\mu\text{F}$ . The permittivity of the medium is: ( $\epsilon_0 = 8.85 \times 10^{-12} \text{C}^2 \text{N}^{-1} \text{m}^{-2}$ )  
 (1)  $1.77 \times 10^{-12} \text{C}^2 \text{N}^{-1} \text{m}^{-2}$                       (2)  $0.44 \times 10^{-10} \text{C}^2 \text{N}^{-1} \text{m}^{-2}$   
 (3)  $5.00 \text{C}^2 \text{N}^{-1} \text{m}^{-2}$                       (4)  $0.44 \times 10^{-13} \text{C}^2 \text{N}^{-1} \text{m}^{-2}$
114. A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is: ( $g = 10 \text{m/s}^2$ )  
 (1) 340 m                      (2) 320 m                      (3) 300 m                      (4) 360 m
115. A body weighs 72 N on the surface of the earth. What is the gravitational force on it, at a height equal to half the radius of the earth?  
 (1) 32 N                      (2) 30 N                      (3) 24 N                      (4) 48 N
116. Two particles of mass 5 kg and 10 kg respectively are attached to the two ends of a rigid rod of length 1 m with negligible mass. The centre of mass of the system from the 5 kg particle is nearly at a distance of:  
 (1) 50 cm                      (3) 67 cm                      (3) 80 cm                      (4) 33 cm
117. The increase in the width of the depletion region in a p – n junction diode is due to:  
 (1) reverse bias only                      (2) both forward bias and revers bias  
 (3) increase in forward current                      (4) forward bias only
118. Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled?  
 (1) four times                      (2) one – fourth                      (3) zero                      (4) doubled

119. Assume that light of wavelength 600 nm is coming from a star. The limit of resolution of telescope whose objective has a diameter of 2m is:  
 (1)  $1.83 \times 10^{-7}$  rad    (2)  $7.32 \times 10^{-7}$  rad    (3)  $6.00 \times 10^{-7}$  rad    (4)  $3.66 \times 10^{-7}$  rad
120. A resistance wire connected in the left gap of metre bridge balances a  $10 \Omega$  resistance in the right gap at a point which divides the bridge wire in the ratio 3 : 2. If the length of the resistance wire is 1.5 m, then the length of  $1 \Omega$  of the resistance wire is:  
 (1)  $1.0 \times 10^{-1}$  m    (2)  $1.5 \times 10^{-1}$  m    (3)  $1.5 \times 10^{-2}$  m    (4)  $1.0 \times 10^{-2}$  m
121. Light with an average flux of  $20 \text{ W / cm}^2$  falls on a non-reflecting surface at normal incidence having surface area  $20 \text{ cm}^2$ . The energy received by the surface during time span of 1 minute is:  
 (1)  $12 \times 10^3$  J    (2)  $24 \times 10^3$  J    (3)  $48 \times 10^3$  J    (4)  $10 \times 10^3$  J
122. A ray is incident at an angle of incidence  $i$  on one surface of a small angle prism (with angle of prism  $A$ ) and emerges normally from the opposite surface. If the refractive index of the material of the prism is  $\mu$ , then the angle of incidence is nearly equal to:  
 (1)  $\frac{2A}{\mu}$     (2)  $\mu A$     (3)  $\frac{\mu A}{2}$     (4)  $\frac{A}{2\mu}$
123. A  $40 \mu\text{F}$  capacitor is connected to a 200 V, 50 Hz ac supply. The rms value of the current in the circuit is, nearly:  
 (1) 2.05 A    (2) 2.5 A    (3) 25.1 A    (4) 1.7 A
124. Dimensions of stress are:  
 (1)  $[\text{ML}^2\text{T}^{-2}]$     (2)  $[\text{ML}^0\text{T}^{-2}]$     (3)  $[\text{ML}^{-1}\text{T}^{-2}]$     (4)  $[\text{MLT}^{-2}]$
125. The Brewster's angle  $i_b$  for an interface should be:  
 (1)  $30^\circ < i_b < 45^\circ$     (2)  $45^\circ < i_b < 90^\circ$     (3)  $i_b = 90^\circ$     (4)  $0^\circ < i_b < 30^\circ$
126. A wire of length  $L$ , area of cross section  $A$  is hanging from a fixed support. The length of the wire changes to  $L_1$  when mass  $M$  is suspended from its free end. The expression for Young's modulus is:  
 (1)  $\frac{Mg(L_1 - L)}{AL}$     (2)  $\frac{MgL}{AL_1}$     (3)  $\frac{MgL}{A(L_1 - L_2)}$     (4)  $\frac{MgL_1}{AL}$
127. A short electric dipole has a dipole moment of  $16 \times 10^{-9} \text{ Cm}$ . The electric potential due to the dipole at a point at a distance of 0.6 m from the centre of the dipole, situated on a line making an angle of  $60^\circ$  with the dipole axis is:  $\left( \frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ Nm}^2 / \text{C}^2 \right)$   
 (1) 200 V    (2) 400 V    (3) Zero    (4) 50 V
128. In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency of 6 Hz. When tension in B is slightly decreased, the beat frequency increases to 7 Hz. If the frequency of A is 530 Hz, the original frequency of B will be:  
 (1) 524 Hz    (2) 536 Hz    (3) 537 Hz    (4) 523 Hz
129. An electron is accelerated from rest through a potential difference of  $V$  volt. If the de Broglie wavelength of the electron is  $1.227 \times 10^{-2} \text{ nm}$ , the potential difference is:

- (1)  $10^2$  V                      (2)  $10^3$  V                      (3)  $10^4$  V                      (4) 10 V

130. The solids which have the negative temperature coefficient of resistance are:

- (1) insulators only                      (2) semiconductors only  
(3) insulators and semiconductors                      (4) metals

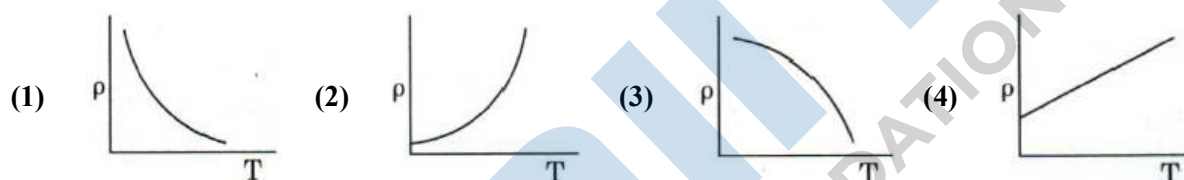
131. The energy required to break one bond in DNA is  $10^{-20}$  J. This value in eV is nearly:

- (1) 0.6                      (2) 0.06                      (3) 0.006                      (4) 6

132. The quantities of heat required to raise the temperature of two solid copper spheres of radii  $r_1$  and  $r_2$  ( $r_1 = 1.5r_2$ ) through 1 K are in the ratio:

- (1) 9/4                      (2) 3/2                      (3) 5/3                      (4) 27/8

133. Which of the following graph represents the variation of resistivity ( $\rho$ ) with temperature (T) for copper?



134. For transistor action, which of the following statements is **correct**?

- (1) Base, emitter and collector regions should have same size  
(2) Both emitter junction as well as the collector junction are forward biased  
(3) The base region must be very thin and lightly doped  
(4) Base, emitter and collector regions should have same doping concentrations

135. For which one of the following, Bohr model is **not** valid?

- (1) Singly ionized helium atom ( $\text{He}^+$ )                      (2) Deuteron atom  
(3) Singly ionized neon atom ( $\text{Ne}^+$ )                      (4) Hydrogen atom

### Section - III (CHEMISTRY)

136. What is the change in oxidation number of carbon in the following reaction?



- (1) 0 to +4                      (2) -4 to +4                      (3) 0 to -4                      (4) +4 to +4

137. On electrolysis of dil. sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be:

- (1) Oxygen gas                      (2)  $\text{H}_2\text{S}$  gas                      (3)  $\text{SO}_2$  gas                      (4) Hydrogen gas

138. An increase in the concentration of the reactants of a reaction leads to change in:

- (1) heat of reaction                      (2) threshold energy                      (3) collision frequency                      (4) activation energy

139. Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as:

- (1) Cannizzaro's reaction                      (2) Cross Cannizzaro's reaction  
(3) Cross Aldol condensation                      (4) Aldol condensation

140. Which of the following alkane cannot be made in good yield by Wurtz reaction?

- (1) 2,3-Dimethylbutane                      (2) n-Heptane



- (3) n-Butane (4) n-Hexane
141. Which of the following is a natural polymer?  
 (1) poly (Butadiene-styrene) (2) polybutadiene  
 (3) poly (Butadiene-acrylonitrile) (4) cis-1,4-polyisoprene
142. A mixture of  $N_2$  and Ar gases in a cylinder contains 7 g of  $N_2$  and 8 g of Ar. If the total pressure of the mixture of the gases in the cylinder is 27 bar, the partial pressure of  $N_2$  is:  
 [Use atomic masses (in  $g\ mol^{-1}$ ): N = 14, Ar = 40]  
 (1) 12 bar (2) 15 bar (3) 18 bar (4) 9 bar
143. Match the following and identify the correct option.
- |                                 |                                    |
|---------------------------------|------------------------------------|
| (a) $CO(g) + H_2(g)$            | (i) $Mg(HCO_3)_2 + Ca(HCO_3)_2$    |
| (b) Temporary hardness of water | (ii) An electron deficient hydride |
| (c) $B_2H_6$                    | (iii) Synthesis gas                |
| (d) $H_2O_2$                    | (iv) Non-planar structure          |
- |     | (a)   | (b)   | (c)  | (d)  |
|-----|-------|-------|------|------|
| (1) | (iii) | (ii)  | (i)  | (iv) |
| (2) | (iii) | (iv)  | (ii) | (i)  |
| (3) | (i)   | (iii) | (ii) | (iv) |
| (4) | (iii) | (i)   | (ii) | (iv) |
144. For the reaction,  $2Cl(g) \rightarrow Cl_2(g)$ , the correct option is:  
 (1)  $\Delta_r H > 0$  and  $\Delta_r S < 0$  (2)  $\Delta_r H < 0$  and  $\Delta_r S > 0$   
 (3)  $\Delta_r H < 0$  and  $\Delta_r S < 0$  (4)  $\Delta_r H > 0$  and  $\Delta_r S > 0$
145. An element has a body centered cubic (bcc) structure with a cell edge of 288 pm. The atomic radius is:  
 (1)  $\frac{\sqrt{2}}{4} \times 288\text{ pm}$  (2)  $\frac{4}{\sqrt{3}} \times 288\text{ pm}$  (3)  $\frac{4}{\sqrt{2}} \times 288\text{ pm}$  (4)  $\frac{\sqrt{3}}{4} \times 288\text{ pm}$
146. Urea reacts with water to form A which will decompose to form B. B when passed through  $Cu^{2+}(aq)$ , deep blue colour solution C is formed. What is the formula of C from the following?  
 (1)  $[Cu(NH_3)_4]^{2+}$  (2)  $Cu(OH)_2$  (3)  $CuCO_3 \cdot Cu(OH)_2$  (4)  $CuSO_4$
147. Reaction between acetone and methylmagnesium chloride followed by hydrolysis will give:  
 (1) Sec. butyl alcohol (2) Tert. butyl alcohol  
 (3) Isobutyl alcohol (4) Isopropyl alcohol
148. The following metal ion activates many enzymes, participates in the oxidation of glucose to produce ATP and with Na, is responsible for the transmission of nerve signals.  
 (1) Copper (2) Calcium (3) Potassium (4) Iron
149. The number of protons, neutrons and electrons in  $^{175}_{71}Lu$ , respectively, are:  
 (1) 104, 71 and 71 (2) 71, 71 and 104 (3) 175, 104 and 71 (4) 71, 104 and 71
150. Which of the following set of molecules will have zero dipole moment?  
 (1) Boron trifluoride, hydrogen fluoride, carbon dioxide, 1,3-dichlorobenzene  
 (2) Nitrogen trifluoride, beryllium difluoride, water, 1,3-dichlorobenzene  
 (3) Boron trifluoride, beryllium difluoride, carbon dioxide, 1,4-dichlorobenzene

(4) Ammonia, beryllium difluoride, water, 1,4-dichlorobenzene

151. Identify a molecule which does not exist.

- (1)  $\text{Li}_2$                       (2)  $\text{C}_2$                       (3)  $\text{O}_2$                       (4)  $\text{He}_2$

152. Identify the incorrect match.

	Name	IUPAC Official Name	
(a)	Unnilunium	(i)	Mendelevium
(b)	Unniltrium	(ii)	Lawrencium
(c)	Unnilhexium	(iii)	Seaborgium
(d)	Unununnium	(iv)	Darmstadtium

- (1) (b), (ii)                      (2) (c), (iii)                      (3) (d), (iv)                      (4) (a), (i)

153. The rate constant for a first order reaction is  $4.606 \times 10^{-3} \text{ s}^{-1}$ . The time required to reduce 2.0 g of the reactant to 0.2 g is:

- (1) 200 s                      (2) 500 s                      (3) 1000 s                      (4) 100 s

154. Identify the correct statement from the following:

- (1) Blister copper has blistered appearance due to evolution of  $\text{CO}_2$ .  
 (2) Vapour phase refining is carried out for Nickel by Van Arkel method.  
 (3) Pig iron can be moulded into a variety of shapes.  
 (4) Wrought iron is impure iron with 4% carbon.

155. Measuring Zeta potential is useful in determining which property of colloidal solution?

- (1) Solubility                      (2) Stability of the colloidal particles  
 (3) Size of the colloidal particles                      (4) Viscosity

156. Which of the following oxoacid of sulphur has  $-\text{O}-\text{O}-$  linkage?

- (1)  $\text{H}_2\text{SO}_4$ , sulphuric acid                      (2)  $\text{H}_2\text{S}_2\text{O}_8$ , peroxodisulphuric acid  
 (3)  $\text{H}_2\text{S}_2\text{O}_7$ , pyrosulphuric acid                      (4)  $\text{H}_2\text{SO}_3$ , sulphurous acid

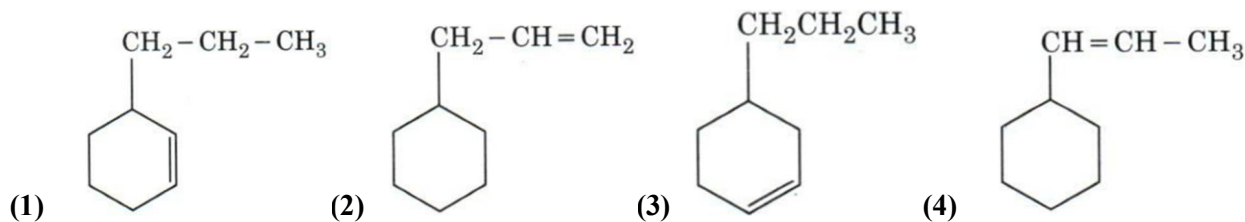
157. Elimination reaction of 2-Bromo-pentane to form pent-2-ene is:

- (a)  $\beta$ -Elimination reaction                      (b) Follows Zaitsev rule  
 (c) Dehydrohalogenation reaction                      (d) Dehydration reaction  
 (1) (a), (c), (d)                      (2) (b),(c), (d)                      (3) (a), (b), (d)                      (4) (a), (b), (c)

158. Identify the correct statements from the following:

- (a)  $\text{CO}_2$  (g) is used as refrigerant for ice-cream and frozen food.  
 (b) The structure of  $\text{C}_{60}$  contains twelve six carbon rings and twenty five carbon rings.  
 (c) ZSM-5, a type of zeolite, is used to convert alcohols into gasoline.  
 (d) CO is colorless and odourless gas.  
 (1) (a) and (c) only                      (2) (b) and (c) only  
 (3) (c) and (d) only                      (4) (a), (b) and (c) only

159. An alkene on ozonolysis gives methanal as one of the product. Its structure is:



160. Paper chromatography is an example of:

- (1) Partition chromatography (2) Thin layer chromatography  
(3) Column chromatography (4) Adsorption chromatography

161. Match the following:

	Oxide		Nature
(a)	CO	(i)	Basic
(b)	BaO	(ii)	Neutral
(c)	Al <sub>2</sub> O <sub>3</sub>	(iii)	Acidic
(d)	Cl <sub>2</sub> O <sub>7</sub>	(iv)	Amphoteric

Which of the following is correct option?

	(a)	(b)	(c)	(d)
(1)	(ii)	(i)	(iv)	(iii)
(2)	(iii)	(iv)	(i)	(ii)
(3)	(iv)	(iii)	(ii)	(i)
(4)	(i)	(ii)	(iii)	(iv)

162. Which one of the followings has maximum number of atoms?

- (1) 1 g of Mg(s) [Atomic mass of Mg = 24] (2) 1 g of O<sub>2</sub> (g) [Atomic mass of O = 16]  
(3) 1 g of Li(s) [Atomic mass of Li = 7] (4) 1 g of Ag(s) [Atomic mass of Ag = 108]

163. Which of the following is a basic amino acid?

- (1) Alanine (2) Tyrosine (3) Lysine (4) Serine

164. The calculated spin only magnetic moment of Cr<sup>2+</sup> ion is:

- (1) 4.90 BM (2) 5.92 BM (3) 2.84 BM (4) 3.87 BM

165. Sucrose on hydrolysis gives:

- (1) α-D-Glucose + β-D-Glucose (2) α-D-Glucose + β-D-Fructose  
(3) α-D-Fructose + β-D-Fructose (4) β-D-Glucose + α-D-Fructose

166. The mixture which shows positive deviation from Raoult's law is:

- (1) Benzene + Toluene (2) Acetone + Chloroform  
(3) Chloroethane + Bromoethane (4) Ethanol-I-Acetone

167. A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following?

- (1) +R effect of -CH<sub>3</sub> groups (2) -R effect of -CH<sub>3</sub> groups  
(3) Hyperconjugation (4) -I effect of -CH<sub>3</sub> groups

168. Find out the solubility of Ni(OH)<sub>2</sub> in 0.1M NaOH. Given that the ionic product of Ni(OH)<sub>2</sub> is 2 × 10<sup>-15</sup>.

- (1) 2 × 10<sup>-8</sup> M (2) 1 × 10<sup>-13</sup> M (3) 1 × 10<sup>8</sup> M (4) 2 × 10<sup>-13</sup> M

169. Which of the following is a cationic detergent?

- (1) Sodium stearate (2) Cetyltrimethyl ammonium bromide  
(3) Sodium dodecylbenzene sulphonate (4) Sodium lauryl sulphate
170. The freezing point depression constant ( $K_f$ ) of benzene is  $5.12 \text{ K kg mol}^{-1}$ . The freezing point depression for the solution of molality  $0.078 \text{ m}$  containing a non-electrolyte solute in benzene is (rounded off up to two decimal places):  
(1)  $0.80 \text{ K}$  (2)  $0.40 \text{ K}$  (3)  $0.60 \text{ K}$  (4)  $0.20 \text{ K}$
171. Identify the incorrect statement.  
(1) The transition metals and their compounds are known for their catalytic activity due to their ability to adopt multiple oxidation states and to form complexes.  
(2) Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.  
(3) The oxidation states of chromium in  $\text{CrO}_4^{2-}$  and  $\text{Cr}_2\text{O}_7^{2-}$  are not the same.  
(4)  $\text{Cr}^{2+}(\text{d}^4)$  is a stronger reducing agent than  $\text{Fe}^{2+}(\text{d}^6)$  in water.
172. Which of the following is not correct about carbon monoxide?  
(1) It reduces oxygen carrying ability of blood.  
(2) The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxy haemoglobin.  
(3) It is produced due to incomplete combustion.  
(4) It forms carboxyhaemoglobin.
173. Hydrolysis of sucrose is given by the following reaction.  
 $\text{Sucrose} + \text{H}_2\text{O} \rightleftharpoons \text{Glucose} + \text{Fructose}$   
If the equilibrium constant ( $K_c$ ) is  $2 \times 10^{13}$  at  $300 \text{ K}$ , the value of  $\Delta_r G^\ominus$  at the same temperature will be:  
(1)  $8.314 \text{ J mol}^{-1}\text{K}^{-1} \times 300\text{K} \times \ln(2 \times 10^{13})$  (2)  $8.314 \text{ J mol}^{-1}\text{K}^{-1} \times 300\text{K} \times \ln(3 \times 10^{13})$   
(3)  $-8.314 \text{ J mol}^{-1}\text{K}^{-1} \times 300\text{K} \times \ln(4 \times 10^{13})$  (4)  $-8.314 \text{ J mol}^{-1}\text{K}^{-1} \times 300\text{K} \times \ln(2 \times 10^{13})$
174. Which of the following is the correct order of increasing field strength of ligands to form coordination compounds?  
(1)  $\text{SCN}^- < \text{F}^- < \text{CN}^- < \text{C}_2\text{O}_4^{2-}$  (2)  $\text{F}^- < \text{SCN}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$   
(3)  $\text{CN}^- < \text{C}_2\text{O}_4^{2-} < \text{SCN}^- < \text{F}^-$  (4)  $\text{SCN}^- < \text{F}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
175. Identify compound X in the following sequence of reactions:
- 
- (1)

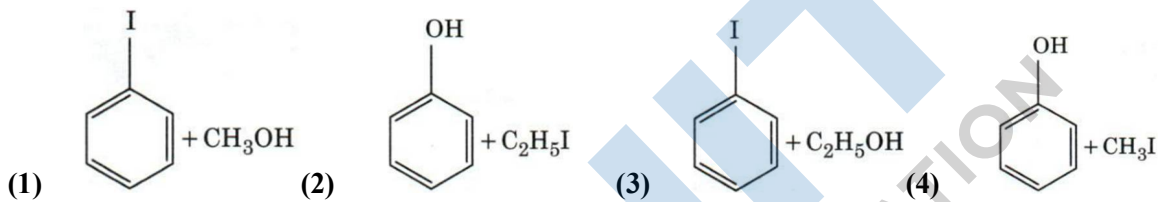
(2)

(3)

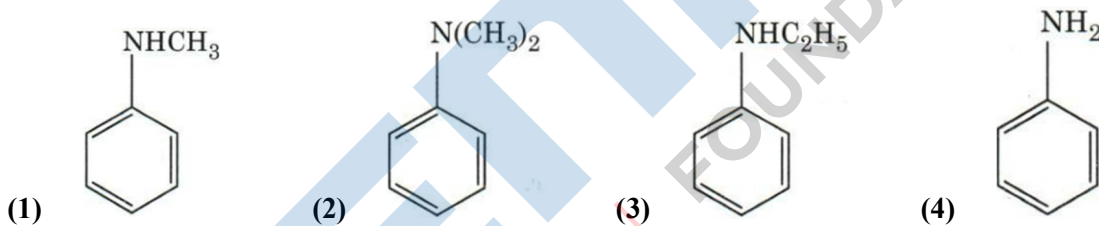
(4)

176. The correct option for free expansion of an ideal gas under adiabatic condition is:  
 (1)  $q = 0, \Delta T < 0$  and  $w > 0$                       (2)  $q < 0, \Delta T = 0$  and  $w = 0$   
 (3)  $q > 0, \Delta T > 0$  and  $w > 0$                       (4)  $q = 0, \Delta T = 0$  and  $w = 0$
177. The number of Faradays(F) required to produce 20 g of calcium from molten  $\text{CaCl}_2$  (Atomic mass of Ca =  $40 \text{ g mol}^{-1}$ ) is:  
 (1) 2                      (2) 3                      (3) 4                      (4) 1
178. HCl was passed through a solution of  $\text{CaCl}_2$ ,  $\text{MgCl}_2$  and NaCl. Which of the following compound(s) crystallise(s)?  
 (1) Only NaCl                      (2) Only  $\text{MgCl}_2$   
 (3) NaCl,  $\text{MgCl}_2$  and  $\text{CaCl}_2$                       (4) Both  $\text{MgCl}_2$  and  $\text{CaCl}_2$

179. Anisole on cleavage with HI gives:



180. Which of the following amine will give the carbylamine test?



NEET : 2020 - Paper Code

**G3****ANSWER KEY**

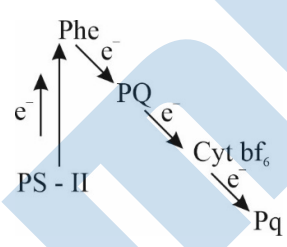
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Q 2	2	Q 47	2	Q 92	4	Q 137	1
Q 3	4	Q 48	4	Q 93	2	Q 138	3
Q 4	1	Q 49	2	Q 94	1	Q 139	3
Q 5	4	Q 50	2	Q 95	4	Q 140	2
Q 6	1	Q 51	4	Q 96	1	Q 141	4
Q 7	4	Q 52	1	Q 97	2	Q 142	2
Q 8	1	Q 53	2	Q 98	1	Q 143	4
Q 9	2	Q 54	1	Q 99	1	Q 144	3
Q 10	3	Q 55	3	Q 100	2	Q 145	4
Q 11	1	Q 56	4	Q 101	1	Q 146	1
Q 12	2	Q 57	1	Q 102	1	Q 147	2
Q 13	1	Q 58	4	Q 103	4	Q 148	3
Q 14	2	Q 59	2	Q 104	1	Q 149	4
Q 15	3	Q 60	3	Q 105	1	Q 150	3
Q 16	2	Q 61	4	Q 106	4	Q 151	4
Q 17	2	Q 62	3	Q 107	1	Q 152	3
Q 18	4	Q 63	3	Q 108	2	Q 153	2
Q 19	4	Q 64	3	Q 109	2	Q 154	3
Q 20	4	Q 65	2	Q 110	2	Q 155	2
Q 21	4	Q 66	1	Q 111	4	Q 156	2
Q 22	3	Q 67	3	Q 112	3	Q 157	4
Q 23	1	Q 68	1	Q 113	2	Q 158	3
Q 24	2	Q 69	3	Q 114	3	Q 159	2
Q 25	4	Q 70	2	Q 115	1	Q 160	1
Q 26	1	Q 71	4	Q 116	2	Q 161	1
Q 27	3	Q 72	4	Q 117	1	Q 162	3
Q 28	4	Q 73	1	Q 118	3	Q 163	3
Q 29	2	Q 74	4	Q 119	4	Q 164	1
Q 30	2	Q 75	4	Q 120	1	Q 165	2
Q 31	1	Q 76	4	Q 121	2	Q 166	4
Q 32	4	Q 77	3	Q 122	2	Q 167	3
Q 33	1	Q 78	4	Q 123	2	Q 168	4
Q 34	1	Q 79	3	Q 124	3	Q 169	2
Q 35	1	Q 80	1	Q 125	2	Q 170	2
Q 36	1	Q 81	3	Q 126	3	Q 171	3
Q 37	4	Q 82	3	Q 127	1	Q 172	2
Q 38	2	Q 83	2	Q 128	1	Q 173	4
Q 39	2	Q 84	1	Q 129	3	Q 174	4
Q 40	1	Q 85	1	Q 130	3	Q 175	2
Q 41	3	Q 86	3	Q 131	2	Q 176	4
Q 42	4	Q 87	3	Q 132	4	Q 177	4
Q 43	2	Q 88	4	Q 133	2	Q 178	1
Q 44	1	Q 89	1	Q 134	3	Q 179	4
Q 45	2	Q 90	4	Q 135	3	Q 180	4

**DETAILED SOLUTION**

**Section- I (BIOLOGY)**

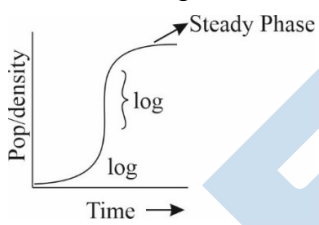
1. (2)  
In the alveoli, high  $pO_2$ , low  $pCO_2$ , lesser  $H^+$  concentration and lower **temperature** are all favourable for the formation of oxyhaemoglobin.
2. (2)  
The organisms that have evolved due to changes in the environment by anthropogenic actions are herbicide resistant weeds, drug resistant eukaryotes and domesticated animals like dogs.
3. (4)  
Gibberellic acid breaks seed dormancy, so can't inhibit dormancy.
4. (1)
 

Column – I	Column – II
(a) Typhoid	(iii) <i>Salmonella</i>
(b) Pneumonia	(iv) <i>Haemophilus</i>
(c) Filariasis	(i) <i>Wuchereria</i>
(d) Malaria	(ii) <i>Plasmodium</i>
5. (4)  
Correct events that occur during inspiration are contraction of diaphragm and external intercostal muscles.
6. (1)  
The oxygenase activity RuBisCo in photorespiration leads to the formation of 1 molecule of 3-phosphoglyceric acid and 1 molecule of 2C compound phosphoglycolic acid.
7. (4)  
Plastoquinone facilitates the transfer of electrons from reaction centre PS – II to cytochrome  $b_6 - f$  complex.



8. (1)  
Ethidium bromide or UV radiation gives orange color to DNA fragments.
9. (2)  
The QRS complex in a standard ECG represents the depolarization of the ventricles.
10. (3)  
Both pollen grain and embryo sac are male and female gametophytes, consisting of two generations.
11. (1)  
The infectious stage of *Plasmodium* that enters the human body is the sporozoite.
12. (2)

Sapwood lies on the peripheral side and heart wood on inner most or in the central cylinder.

13. (1)  
Flippers of Penguins and Dolphins are examples of convergent evolution.
14. (2)  
 $I^A$  produces galactosamine sugar and  $I^B$  produces galactose sugar.
15. (3)  
In Urochordata notochord is present in the tail region of larva and absent in adult.  
In vertebrate notochord is present during the embryonic period only and later replaced by vertebral column.  
In Phylum Chordata central nervous system is dorsal and hollow.  
Chordata is divided into three sub-phyla: Cephalochordata, Urochordata and Vertebrata.
16. (2)  
Presence of conditions like ketonuria and glycosuria in urine are indicative of Diabetes Mellitus.
17. (2)  
The first phase of translation is aminoacylation of tRNA  
(a)  $AA(\text{aminoacid}) + ATP + E \xrightarrow{Mg^{+2}} AA \sim AMP + E + PPi$   
(b)  $AA \sim AMP + E + tRNA \longrightarrow AA \sim tRNA + AMP + E$
18. (4)  
Ray florets of sunflower have inferior or epigynous as above the ovary all other floral parts are present.
19. (4)  
The maximum growth occurs during the log or exponential phase.
- 
20. (4)  
The roots that originate from the base of the stem are fibrous roots.
21. (4)  
In water hyacinth and water lily although they are aquatic but floating so pollination takes place by insect or
22. (3)  
Activated sludge is put into anaerobic sludge digester for further sewage treatment.
23. (1)  
Platyhelminthes are bilaterally symmetrical and acoelomate animals.  
Aschelminthes are pseudocoelomate and bilaterally symmetrical animals.  
Annelids are schizocoelomic and bilaterally symmetrical  
Ctenophora are acoelomate and radially symmetrical.
24. (2)  
Basic amino acid is Lysine. Glutamic acid is acidic. Valine and tyrosine are neutral amino acids.
25. (4)  
ZIFT and IUT are the techniques in which embryos are transferred to assist those females who cannot conceive.



26. (1)  
Inclusion bodies are non – living structures present in cytoplasm where food, chemical compounds, gases are stored but no digestion takes place.
27. (3)  
Morgan has given experimental verifications of the chromosomal theory of inheritance.
28. (4)  
Gonorrhoea, Syphilis and Genital herpes are all sexually transmitted diseases.
29. (2)  
In man insulin is present as proinsulin with C peptide chain and A and B peptide chains are linked with disulphide bonds.
30. (2)  
The formation of glycoproteins and glycolipids in eukaryotic cells occur in Golgi bodies.
31. (1)
- | Column – I                        | Column – II                           |
|-----------------------------------|---------------------------------------|
| (a) <i>Clostridium butylicum</i>  | (ii) Butyric acid                     |
| (b) <i>Trichoderma polysporum</i> | (i) Cyclosporin- A                    |
| (c) <i>Monascus purpureus</i>     | (iv) Blood cholesterol lowering agent |
| (d) <i>Aspergillus niger</i>      | (iii) Citric acid                     |
32. (4)  
Embryological support for evolution was disapproved by Karl Ernst von Bear.
33. (1)  
The ori or origin of replication is the sequence from where replication starts and any piece of DNA when linked to this sequence can be roots to replicate within the last cells. It is also responsible for controlling the copy number of linked DNA.
34. (1)  
Viroids have only RNA without protein and infects only plants.
35. (1)  
Montreal protocol was signed in 1987 for control of emission of ozone depleting substances.
36. (1)  
The number of substrate level phosphorylation in Krebs cycle is one.
37. (4)  
High concentration level of Estrogen hormone will cause release of ovum from the Graafian follicle.
38. (2)  
Phenylketonuria is an autosomal recessive disease, Thalassemia is an autosomal disorder and Haemophilia is X – linked recessive disorder sickle cell anaemia is autosomal recessive disorder.
39. (2)  
Cuboidal epithelium with brush border of microvilli is found in proximal convoluted tubule of nephrons.
40. (1)  
Snow-blindness in Antarctica region is due to inflammation of cornea due to high dose of UV-B radiation.

41. (3)  
Chlorella and spirulina are unicellular and Anabaena is cyanobacteria rest are multicellular.
42. (4)  
In monocots stem vascular bundles are scattered without cambium, hence closed, ground tissue have cortex only and phloem parenchyma are absent.
43. (2)  
There are 7 pairs of contrasting character so true breeding varieties are  $7 \times 2 = 14$
44. (1)  
Florioid starch are composed of amylopectin and glycogen.
45. (2)  
In G1 phase of interphase the cell is metabolically active, grows but does not replicate its DNA.
46. (2)  
A new breed of Hisardale, by using Bikaneri ewes and Marino rams was produced by cross breeding technique.
47. (2)  
Active Immunity does not happen immediately upon disease exposure. It can take days or weeks after the first exposure for active immunity to develop. But once it does so, the protection can last an entire lifetime.
48. (4)  
Eco RI cuts at giving sticky ends.  $5'GAATTC3'$   
 $3'CTTAAG5'$
49. (2)  
Length = No. of base pairs  $\times$  distance between base pairs  
 $= 6 \times 10^9 \text{ pb} \times 0.34 \times 10^{-9} \text{ m} = 2.2 \text{ meters}$
50. (2)  
If the head of cockroach is removed, it may live for few days because the head holds a small proportion of nervous system while the rest is situated along the ventral part of its body.
51. (4)  

Grass $\rightarrow$	Rabbit $\rightarrow$	Crow $\rightarrow$	Vulture $\rightarrow$
$T_1$	$T_2$	$T_3$	$T_4$
First trophic level	2 <sup>nd</sup> trophic level	3 <sup>rd</sup> trophic level	4 <sup>th</sup> trophic level
52. (1)  
The enzyme enterokinase help in conversion of trypsinogen into trypsin.
53. (2)  
Ileum is the highly coiled part of small intestine.
54. (1)  
Gibberellin increases the length of the dwarf plant when sprayed.
55. (3)

These enzymes are called genetic gum. They join two individual fragment of dsDNA by forming phosphodiester bonds between them they help in sealing the gaps mDNA fragments.

56. (4)

- |                                     |               |
|-------------------------------------|---------------|
| (a) Inhibitor of catalytic activity | (ii) Malonate |
| (b) Possess peptide bond            | (iv) Collagen |
| (c) Cell wall material in fungi     | (iii) Chitin  |
| (d) Secondary metabolite            | (i) Ricin     |

57. (1)

Goblet cells of alimentary canal are modified form of columnar epithelial cells.

58. (4)

- | Column – I                   | Column – II          |
|------------------------------|----------------------|
| (a) 6-15 pairs of gill slits | (ii) Cyclostomes     |
| (b) Heterocercal caudal fin  | (iii) Chondrichthyes |
| (c) Air bladder              | (iv) Osteichthyes    |
| (d) Poison sting             | (i) <i>Trygon</i>    |

59. (2)

Dissolution of synaptonemal complex occurs during Diplotene stage of Prophase I.

60. (3)

Enzyme that facilitates opening of helix during transcription is RNA polymerase

61. (4)

Adenine pairs with thymine with the help of 2H bonds.

62. (3)

Amazon forests falls in tropical rain forest where there is no seasonal variation, so it have highest diversity called as lungs of the planet.

63. (2)

- | Column – I          | Column – II              |
|---------------------|--------------------------|
| (a) Pituitary Gland | (iii) Diabetes insipidus |
| (b) Thyroid Gland   | (i) Grave's disease      |
| (c) Adrenal Gland   | (iv) Addison's disease   |
| (d) Pancreas        | (ii) Diabetes mellitus   |

64. (3)

The reaction catalysed by nitrogenase in root noduler of leguminous plants is ammonia and hydrogen.

65. (2)

Iron required in synthesis of chlorophyll, Mn is the main photolytic reagent, Boron is for pollen germination and zinc is the precursor for auxin of IAA biosynthesis.

66. (1)

Reabsorption of Na<sup>+</sup> and water from renal tubules due to aldosterone would help in prevention of diuresis.

67. (3)

Meiotic division of the secondary oocyte in completed at the time of fusion of a sperm with an ovum.

68. (1)

Column – I

Column – II

- (a) Gregarious, polyphagous pest  
(b) Adult with radial symmetry and Larva with bilateral symmetry  
(c) Book lungs  
(d) Bioluminescence
- (iv) *Locusta*  
(i) *Asterias*  
(ii) Scorpion  
(iii) *Ctenoplana*
69. (3)
- | Column – I         | Column – II  |
|--------------------|--|
| (a) Floating Ribs  | (iv) Do not connect with the sternum                         |
| (b) Acromion       | (iii) Clavicle   |
| (c) Scapula        | (i) Located between 2 <sup>nd</sup> and 7 <sup>th</sup> ribs |
| (d) Glenoid cavity | (ii) Head of the humerus                                     |
70. (2)  
Secondary metabolites of plants are for defence i.e. to protect from herbivores
71. (4)  
(a) Bt cotton – *Bacillus thuringensis*  
(b) Adenosinase for gene therapy deaminase  
(c) RANi for cellular defence  
(d) PCR to detect HIV virus
72. (4)  
S. L. Miller produced amino acids by mixing the CH<sub>4</sub>, H<sub>2</sub>, NH<sub>3</sub> and water vapours at 800° C in his experiment.
73. (1)  
(a) *B. thuringensis* – cry proteins  
(b) *Thermococcus aquaticus* – DNA polymerase  
(c) *Agrobacterium tumefaciens* → cloning vector  
(d) *Salmonella typhimurium* → Construction of first rDNA molecule
74. (4)  
Bt. Cotton and Bt corn both are made resistant to insects pests.
75. (4)  
Polymerase elongates DNA chain, nucleases digests nucleic acid, endonuclease makes cuts at specific sites but ligase joins the two DNA molecules
76. (4)  
The region where the body of the ovule is fused with funicle is called hilum.
77. (3)  
Strobili or cones are found in *Equisetum*
78. (4)
- | Column – I      | Column – II                                    |
|-----------------|--|
| (a) Eosinophils | (iii) Release histaminases, destructive enzyme |
| (b) Basophils   | (iv) Release granules containing histamine     |
| (c) Neutrophils | (ii) Phagocytosis                              |
| (d) Lymphocytes | (i) Immune response                            |
79. (3)  
Glycosidic bond is present in Inulin (Polymer of fructose)  
Peptide bond is present in insulin (Peptide hormone)

80. (1)  
**NPP** (Net primary productivity) = GPP (Gross primary productivity) - R (Respiration)  
 So NPP is always be lesser then GPP.
81. (3)  

<b>Column – I</b> (a) Placenta (b) Zona pellucida (c) Bulbo-urethral glands (d) Leydig cells	<b>Column – II</b> (ii) Human Chorionic Gonadotropin (hCG) (iii) Layer of ovum (iv) Lubrication of the penis (i) Androgens
--	--
82. (3)  
 Species interaction is not an population attribute.
83. (2)  

<b>Column – I</b> (a) Organ of Corti (b) Cochlea (c) Eustachian tube (d) Stapes	<b>Column – II</b> (iv) Located on the basilar membrane (ii) Coiled part of labyrinth (i) Connects middle ear and pharynx (iii) Attached to the oval window
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84. (1)  
 The most abundant protein in the animals is collagen.
85. (1)  

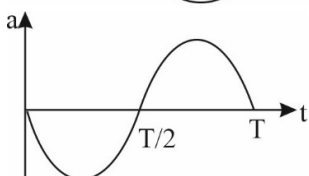
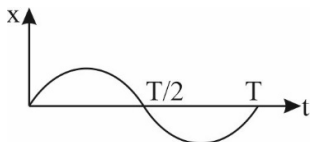
(a) Zygotene (b) Pachytene (c) Diplotene (d) Diakinesis	(iv) Synapsis (iii) Crossing over (ii) Chiasmata (i) Terminalization
--	---
86. (3)  
 According to Robert May, the global species diversity is about 7 million.
87. (3)  
 The half inferior ovary or penguin us condition is formed in plum.
88. (4)  
 Glucagon is associated with hyperglycemia.  
 Insulin acts upon liver cells, muscles and adipocytes.  
 Insulin is associated with conversion of glucose to glycogen in liver.  
 Glucocorticoids stimulate gluconeogenesis.
89. (1)  
 Guttation is removal of excess of water in the form of water droplet from the tips through hydathodes at night in herbaceous plants due to root pressure.
90. (4)  
 The process of cell entering an inactive vegetative stage called quiescent stage ( $G_0$  stage) occurs at the end of M phase.  $G_0$  stage is an extended  $G_1$  phase.

## Section - II (PHYSICS)

91. (4)

$$x = A \sin \omega t$$

$$a = -\omega^2 A \sin \omega t$$

Phase difference =  $\pi$ 

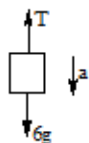
92. (4)

$$B = \mu_0 ni$$

$$4\pi \times 10^{-7} \times \left(\frac{100}{0.5}\right) \times 2.5 = 6.28 \times 10^{-4} \text{ T}$$

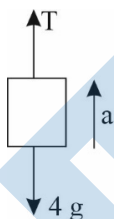
93. (2)

FBD of 6 kg block



$$6g - T = 6a \quad \text{(i)}$$

FBD of 4 kg block



$$T - 4g = 4a \quad \text{(ii)}$$

Solving (i) &amp; (ii)

$$a = g/5$$

94. (1)

Average energy density is equally distributed between electrical and magnetic components.

95. (4)

Potential is constant,

$$\therefore |\vec{E}| = 0$$

96. (1)

Degree of freedom for a monoatomic gas ( $f$ ) = 3

$$\therefore E = \frac{3K_B T}{2}$$

97. (2)

$$\begin{aligned} \vec{\tau} &= \vec{r} \times \vec{F} \\ &= (2\hat{k}) \times (3\hat{j}) = -6\hat{i} \end{aligned}$$

98. (1)

$$\text{Mean free path} = \frac{1}{\sqrt{2}n\pi d^2}$$

All other options are dimensionally incorrect.

99. (1)

$$\begin{aligned} E &= mc^2 \\ &= \left(\frac{0.5}{1000}\right)(3 \times 10^8)^2 = 4.5 \times 10^{13} \text{ J} \end{aligned}$$

100. (2)

$$\text{L.C.} = \frac{\text{pitch}}{\text{No. of divisions}}$$

$$\begin{aligned} \therefore \text{pitch} &= (0.01 \times 50) \text{ mm} \\ &= 0.5 \text{ mm} \end{aligned}$$

101. (1)

Sudden expansion is taking place therefore the process is adiabatic.

102. (1)

$$PV = \frac{m}{M} RT$$

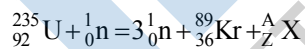
$$\text{or } P = \frac{\rho RT}{M}$$

$$\rho = \frac{PM}{RT}$$

Putting the values we will get

$$\rho = 0.2 \text{ kg/m}^3$$

103. (4)



$$235 + 1 = 3 \times 1 + 89 + A$$

$$\therefore A = 144$$

104. (1)

$$\mu = \frac{V_d}{E}$$

$$\text{or } \mu = \frac{7.5 \times 10^{-4}}{3 \times 10^{-10}}$$

$$\text{or } \mu = 2.5 \times 10^6 \text{ m}^2 \text{V}^{-1} \text{s}^{-1}$$

105. (1)

$$9.99 - 0.0099 = 9.9801$$

But the final answer must contain only two digits after the decimal. So the right answer is 9.98

106. (4)

$$\mu = \mu_0(1 + \chi)$$

$$\therefore \mu = 4\pi \times 10^{-7} \times (1 + 599)$$

$$= 2.4\pi \times 10^{-4} \text{ T mA}^{-1}$$

107. (1)

$$E = \frac{KQ}{r^2} = \frac{9 \times 10^9 \times 3.2 \times 10^{-7}}{(15 \times 10^{-2})^2} = 1.28 \times 10^5 \text{ N/C}$$

108. (2)

In case (1)

$$|\tan \phi_1| = \frac{X_L}{R}$$

In case (2)

$$|\tan \phi_2| = \frac{X_C}{R}$$

But  $\phi_1 = \phi_2 = \pi/3$

$$\therefore X_L = X_C \text{ (condition for resonance)}$$

So  $\cos \phi = 1$

109. (2)

$$h = \frac{2T \cos \theta}{r \rho g}$$

If  $r_f = 2r$

$$\text{Then } h_f = \frac{h}{2}$$

$$V_i = \pi r^2 h$$

$$V_f = \pi (2r)^2 \left(\frac{h}{2}\right) = 2\pi r^2 h$$

$$\frac{V_f}{V_i} = \frac{m_f}{m_i} = 2$$

$$\therefore m_f = 10.0 \text{ g}$$

110. (2)

$$\beta = \frac{\lambda D}{d}$$

$$\beta' = \frac{\lambda(2D)}{d/2} = 4 \frac{\lambda D}{d}$$

$$\therefore \beta' = 4\beta$$

111. (4)

Given logic circuit will act as AND gate.



$$y = \overline{\overline{A + B}}$$

$$y = AB$$

∴ Truth table should be

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

112. (3)

First two digits of the resistance are decided by the first two strips. Third strip gives the value of multiplier and fourth strip gives the value of tolerance. If we refer to the table for the given colours

$$R = (47 \times 10^1) \pm 5\%$$

113. (2)

$$K = \frac{C}{C_0} = \frac{30\mu\text{F}}{6\mu\text{F}}$$

$$\epsilon = \epsilon_0 K$$

$$= 8.8 \times 10^{-12} \times 5$$

$$= 0.44 \times 10^{-10} \text{C}^3 \text{N}^{-1} \text{m}^{-2}$$

114. (3)

If height of the tower is h

$$(80)^2 - (20)^2 = 2 \times 10 \times h$$

$$h = 300 \text{ m}$$

115. (1)

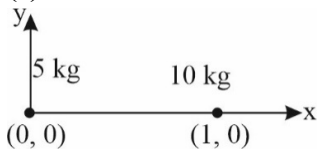
$$\text{At } h = \frac{R}{2}$$

$$g' = \frac{g}{\left(1 + \frac{R}{2R}\right)^2}$$

$$g' = \frac{4g}{9}$$

$$\therefore mg' = \frac{4}{9}(mg)$$

116. (2)



$$x_{\text{cm}} = \frac{5 \times 0 + 10 \times 1}{5 + 10}$$

$$= 0.67 \text{ m} = 67 \text{ cm}$$

117. (1)

Width of depletion region increases in reverse bias.

118. (3)

If  $f = 0.75 f_0$ , where  $f_0$  is threshold frequency, photoemission will not take place.

$\therefore$  correct answer is (3)

119. (4)

$$\theta_0 \text{ (limit of resolution)} = \frac{1.22\lambda}{D}$$

$$\theta_0 = \frac{1.22 \times 600 \times 10^{-9}}{2}$$

$$\theta_0 = 3.66 \times 10^{-7} \text{ rad}$$

120. (1)

$$\frac{X}{10} = \frac{3}{2}$$

$$\therefore X = 15\Omega$$

If length of the wire is 1.5 m then

For  $1\Omega$  resistance,

$$\text{length} = \frac{1.5}{15} \text{ m} = 1.0 \times 10^{-1} \text{ m}$$

121. (2)

Power = (Flux)  $\times$  (Area)

$$= \left( \frac{20 \text{ W}}{\text{cm}^2} \right) (20 \text{ cm}^2)$$

$$= 400 \text{ W}$$

Energy received in 1 minute

$$= 60 \times 400 \text{ g} = 24 \times 10^3 \text{ g}$$

122. (2)

If A is small

$$\delta = (\mu - 1)A \quad \text{(i)}$$

Also

$$i + e = \delta + A$$

$$\text{but } e = 0$$

$$\therefore i - A = \delta \quad \text{(ii)}$$

From (i) & (ii)

$$i - A = (\mu - 1)A$$

$$\text{or } i = \mu A$$

123. (2)

$$i_{\text{rms}} = \frac{V_{\text{rms}}}{X_c}$$

$$X_c = \frac{1}{\omega C}$$

$$\begin{aligned} \therefore i_{\text{rms}} &= 200 \times 100\pi \times 40 \times 10^{-6} \\ &= 2.51 \text{ A} \approx 2.5 \text{ A} \end{aligned}$$

124. (3)

$$[\text{Stress}] = \frac{[\text{Force}]}{[\text{Area}]} = \frac{[\text{MLT}^{-2}]}{[\text{L}^2]} = [\text{ML}^{-1}\text{T}^{-2}]$$

125. (2)

$$\tan i_b = \mu$$

$$\mu > 1$$

$$\therefore i_b > \frac{\pi}{4}$$

126. (3)

$$Y = \frac{\text{stress}}{\text{strain}}$$

$$\text{Stress} = \frac{Mg}{A}$$

$$\text{Strain} = \frac{\Delta L}{L} = \frac{L_1 - L}{L}$$

$$Y = \frac{MgL}{A(L_1 - L)}$$

127. (1)

Potential at a general point  $(r, \theta)$  due to a small dipole is given by

$$\begin{aligned} V &= \frac{1}{4\pi\epsilon_0} \left( \frac{p}{r^2} \right) \\ &= \frac{9 \times 10^9 \times 16 \times 10^{-9}}{(0.6)^2} = 200 \text{ V} \end{aligned}$$

128. (1)

$$|f_A - f_B| = 6 \text{ Hz}$$

$$f_A = 530 \text{ Hz}$$

$$\therefore f_B \text{ can be } 524 \text{ Hz or } 536 \text{ Hz}$$

With decrease in tension velocity as well as frequency of B should decrease therefore possible answer is 524 Hz.

129. (3)

For an electron

$$\lambda = \frac{1.227}{\sqrt{V}} \text{ mm}$$

Where  $V$  is accelerating potential

$$\Rightarrow \sqrt{V} = \frac{1.227}{1.22 \times 10^{-2}}$$

or  $V = 10^4$  volts

130. (3)

Conductivity of semiconductors as well as insulators increases with increase in temperature.

131. (2)

$$1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$$

$$\therefore E = \frac{10^{-20}}{1.6 \times 10^{-19}} \text{ eV} = 0.06 \text{ eV}$$

132. (4)

$$\frac{Q_1}{Q_2} = \frac{m_1 s_1 \Delta T_1}{m_2 s_2 \Delta T_2}$$

$$s_1 = s_2, \Delta T_1 = \Delta T_2$$

$$\frac{m_1}{m_2} = \frac{\rho(4/3\pi r_1^3)}{\rho(4/3\pi r_2^3)} = \frac{27}{8}$$

$$\therefore \frac{Q_1}{Q_2} = \frac{27}{8}$$

133. (2)

$$\rho = \rho_0 \{1 + \alpha(\Delta T) + \beta(\Delta T)^2\}$$

Resistivity increases parabolically with temperature.

134. (3)

In a transistor,

Order of size: Collector > emitter > base

Order of doping concentration: emitter > collector > base

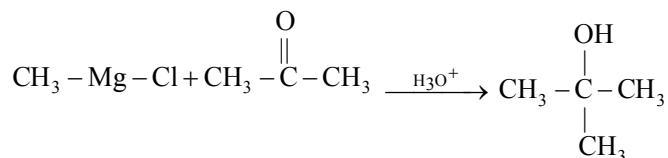
$\therefore$  correct option is (3)

135. (3)

Bohr model is valid for uni-electron systems only.

**Section - III (CHEMISTRY)**

136. (2)  
In  $\text{CH}_4$  carbon has oxidation state of  $-4$  and in  $\text{CCl}_4$  its oxidation state is  $+4$ .
137. (1)  
At anode  $4\text{OH}^- \rightarrow 2\text{H}_2\text{O} + \text{O}_2 + 4\text{e}^-$  will occur as  $\text{OH}^-$  will have lesser discharge energy.
138. (3)  
Increase in the concentration of reactants leads to a change in Collision frequency.
139. (3)  
As acetophenone has  $\alpha$ -hydrogen and benzaldehyde does not so, this will be a crossed Aldol condensation
140. (2)  
n-heptane is an unsymmetrical alkane it cannot be obtained in good yield through a Wurtz reaction.
141. (4)  
Cis-polyisoprene is Natural rubber & hence is a natural elastomer.
142. (2)  
7 g  $\text{N}_2$  is  $\frac{1}{4}$  mole  $\text{N}_2$  and 8 g Ar =  $\frac{1}{5}$  mole Ar.  
Mole fraction of  $\text{N}_2 = \frac{\frac{1}{4}}{\frac{1}{4} + \frac{1}{5}} = \frac{1}{4} \times \frac{4 \times 5}{9} = \frac{5}{9}$   
Mole fraction of Ar =  $\frac{4}{9}$  Partial pressure of  $\text{N}_2 = 27 \times \frac{5}{9} = 15$  bar
143. (4)  
Temporary hardness:  $\text{Mg}(\text{HCO}_3)_2 + \text{Ca}(\text{HCO}_3)_2$   
 $\text{CO} + \text{H}_2$  : Synthesis gas  
 $\text{B}_2\text{H}_6$  : Electron deficient hydride  
 $\text{H}_2\text{O}_2$  : Non-planar structure
144. (3)  
 $2\text{Cl}(\text{g}) \rightarrow \text{Cl}_2(\text{g})$ ,  $\Delta H_r < 0$  as bond is being formed & as number of particles are decreasing so  $\Delta S_r < 0$ .
145. (4)  
For bcc unit cell  $r = \frac{\sqrt{3}a}{4} \Rightarrow r = \frac{\sqrt{3}}{4} \times 288$
146. (1)  
Urea on decomposition with water will give  $\text{NH}_3$  which on reaction with  $\text{Cu}^{+2}$  will form  $[\text{Cu}(\text{NH}_3)_4]^{+2}$ .
147. (2)



148. (3)

Among these, potassium is responsible for transmission of nerve signals by activating enzymes during oxidation of glucose for production of ATP.


149. (4)

$\text{Lu}_{71}^{175}$  has 71 protons, 104 neutrons & 71 electrons.

150. (3)

Boron trifluoride ( $\text{F} \begin{array}{c} \diagup \\ \text{B} \\ \diagdown \\ \text{F} \\ | \\ \text{F} \end{array}$ ) has zero dipole moment beryllium difluoride is linear (F – Be – F) will zero dipole moment.

Carbondioxide (O = C = O) is again linear will zero dipole moment.

1,4-dichlorobenzene (Cl--Cl) will again have zero dipole moment

151. (4)

$\text{He}_2$  has zero bond order and hence does not exist.

152. (3)

Element with atomic number 119 does not have any official name. Darmstadtium has atomic number 110.

153. (2)

$$t = \frac{2.303}{4.606 \times 10^{-3}} \log \frac{2}{0.2} = \frac{1}{2} \times 100 = 500 \text{ sec}$$

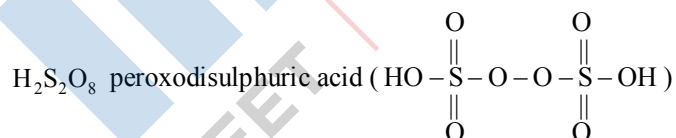
154. (3)

Pig iron can be molded into variety of shapes. All other given statements are incorrect.

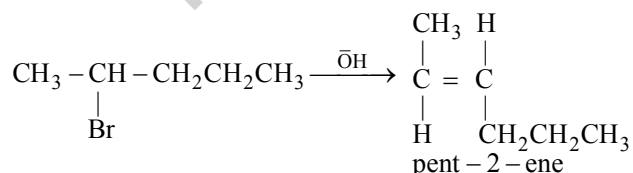
155. (2)

Zeta potential or electrokinetic potential is used to determine the stability of a colloidal sol

156. (2)



157. (4)



Follows Zaitsev rule, is a  $\beta$ -Elimination reaction & is Dehydrohalogenation reaction also. This is not a dehydration reaction.

158. (3)

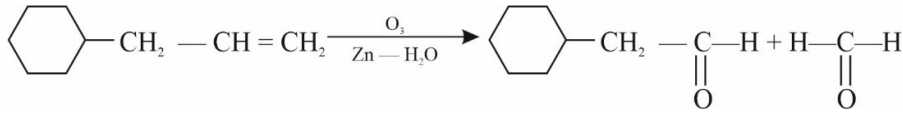
Buckminster Fullerene contains twenty hexagonal and twelve pentagonal rings.

CO<sub>2</sub> as dry Ice is used as refrigerant for ice-cream and not gas.

ZSM-5 (Zeolite of Molecular Sieve -5) is a shape selective catalyst & used for conversion of alcohol to petrol.

CO is a colorless & Odorless gas.

159. (2)



160. (1)

Paper chromatography is based upon the principle of partition chromatography.

161. (1)

CO is a neutral oxide

BaO is a basic oxide

Al<sub>2</sub>O<sub>3</sub> is an amphoteric oxide

Cl<sub>2</sub>O<sub>7</sub> is a strongly acidic oxide.

162. (3)

$$1 \text{ g Mg is } \frac{1}{24} \text{ moles so atoms} = \frac{1}{24} \times N_A$$

$$1 \text{ g O}_2 \text{ is } \frac{1}{32} \text{ moles so atoms} = \frac{1}{32} N_A \times 2 = \frac{1}{16} \times N_A$$

$$1 \text{ g Li is } \frac{1}{7} \text{ moles so atoms} = \frac{1}{7} \times N_A$$

$$1 \text{ g Ag is } \frac{1}{108} \text{ moles so atoms} = \frac{1}{108} \times N_A. \text{ As per this calculation, Li will have the highest number of atoms}$$

163. (3)

Lysine is a basic amino acid.

164. (1)

Spin only magnetic moment of Cr<sup>+2</sup>(3d<sup>4</sup>)

$$\sqrt{n(n+2)}\text{BM} = \sqrt{24}\text{BM} = 4.91\text{BM}$$

165. (2)

Sucrose on hydrolysis gives α-D-glucose and β-D-Fructose

166. (4)

Ethanol + Acetone is a positive deviating solution

167. (3)

3° cation is more stable than 2°-cation due to Hyperconjugation

168. (4)

$$(\text{Ionic Product}) \text{ ip} = [\text{Ni}^{+2}][\text{OH}^-]^2 = 2 \times 10^{-15}$$

$$[\text{Ni}^{+2}][0.1]^2 = 2 \times 10^{-15} \Rightarrow \text{New solubility} = 2 \times 10^{-13}$$

169. (2)

Cetyl trimethyl ammonium bromide is a cationic detergent.

170. (2)

$$\Delta T_f = 5.12 \times 0.078 = 0.4\text{K}$$

171. (3)

Oxidation state of Cr in  $\text{CrO}_4^{2-}$  and  $\text{Cr}_2\text{O}_7^{2-}$  are both same with a value of (+6)

172. (2)

Carboxyhaemoglobin is more stable than oxy haemoglobin as CO is a strong field ligand.

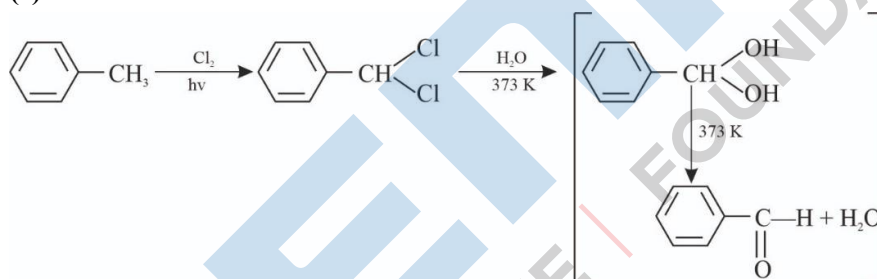
173. (4)

$$\Delta G^\circ = -RT \ln K_{\text{eq}} = -8.314 \times 300 \times \ln(2 \times 10^{13})$$

174. (4)

The order of ligands field strength as per spectro-chemical series is  $\text{SCN}^- < \text{F}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$ 

175. (2)



176. (4)

$q = 0, \Delta T = 0$  and  $w = 0$  as there will be no work against vacuum. As  $q = 0$  and  $w = 0$  so,  $\Delta U = 0$  which is why  $\Delta T = 0$

177. (4)



2F charge is needed to produce 40 g Ca

So, 1 F charge is needed to produce 20 g Ca

178. (1)

As per concept only NaCl will crystallise out on passing HCl and  $\text{CaCl}_2$  and  $\text{MgCl}_2$  will remain in solution as they are more soluble.

179. (4)



180. (4)

Carbylamine test is given by 1°-amines, both aliphatic &amp; aromatic.